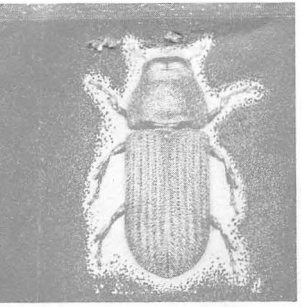
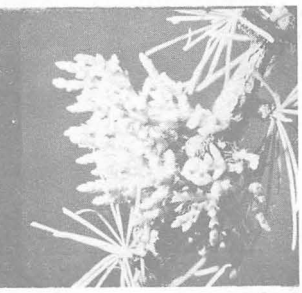
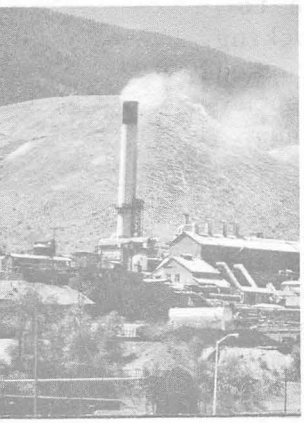
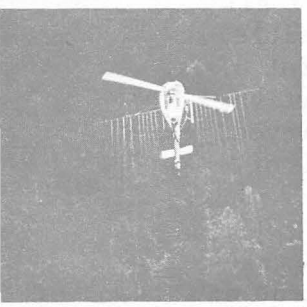
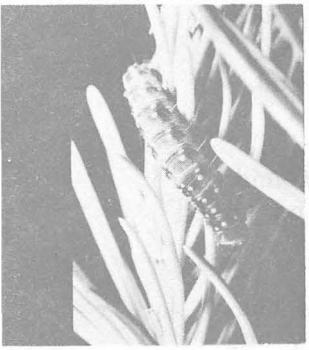
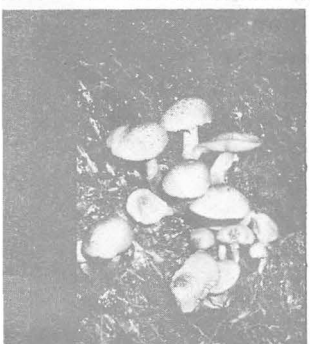

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FOREST INSECT & DISEASE MANAGEMENT

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PRELIMINARY RESULTS OF SEEDLING DAMAGE SURVEYS IN YOUNG PLANTATIONS ON SELECTED FORESTS IN REGION 1

By

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INTRODUCTION

Based on per acre costs, plantation establishment is one of the most expensive silvicultural practices (Pfister 1976), but only token studies have been done on frequency and causes of seedling injury and mortality in Region 1 plantations (Wellner 1976). Therefore, we conducted a survey in 1978 on four National Forests to document frequency and causes of seedling injury or mortality in young plantations and to show land managers where plantation pest management might be desirable.

METHODS

We selected the Clearwater and the Nezperce National Forests in Idaho and the Lolo and Flathead National Forests in Montana to survey injury of planted seedlings. We were primarily concerned with plantations within the Douglas-fir, grand fir, and redcedar habitats that contained Douglas-fir, ponderosa pine, lodgepole pine, western larch, or Engelmann spruce seedlings planted between 1974 and 1978, but examined several plantations on the Clearwater National Forest that contained western white pine seedlings.

Plantations selected for examination were identified using Ranger District compartment records and were located on aerial photos before they were visited. Straight line transects intersecting a variety of topographic conditions, aspects, elevations, physiographic positions, and proximity to adjacent stands were traversed in each plantation. Circular 1/100-acre (radius = 11.8 ft.) sample plots located at equidistant intervals on each transect were examined, and each planted seedling was recorded by species and condition on a plot sample form (appendix).

RESULTS

Average stocking levels in surveyed plantations were low compared to desired stocking levels (table 1), but we do not know original stocking levels. A probable contributor to low stocking levels is gopher-caused seedling loss. However, this survey was not designed to reveal such loss because gophers often pull seedlings into their burrows, thus eliminating evidence of damage.

One-half to three-quarters of all seedlings examined, depending on species, were undisturbed (table 2). When considering all species and all forests combined, browsing by domestic stock or big game animals, and defoliation by insects each accounted for 6 percent of all examined seedlings, or 19 percent of all injured seedlings. Trampling by domestic stock or big game animals was the next most common cause of injury, and accounted for 4 percent of all examined seedlings, or 12 percent of all injured seedlings. Since domestic stock and big game are responsible for both browsing and trampling of seedlings, and injured 31 percent of all injured seedlings, we conclude that they are the most destructive agent to young planted seedlings in the four National Forests surveyed, especially on the Nezperce National Forest where over 50 percent of injured seedlings were trampled or browsed.

Defoliation, primarily by the western spruce budworm and the larch casebearer, occurred on 20 percent of all grand fir seedlings, 15 percent of western larch seedlings, 7 percent of Douglas-fir seedlings, and 4 percent of Engelmann spruce seedlings (table 2). Defoliation was more common on the Clearwater and Lolo Forests than on the Nezperce and Flathead Forests.

Frost damage was most prevalent on the Flathead Forest, but was found extensively in only two Douglas-fir and Engelmann spruce plantations that had been established in natural frost pockets.

The western pine-shoot borer, a pine regeneration pest that mines the pith of terminal and lateral shoots, was found extensively in only one ponderosa pine plantation on the Nezperce Forest. This species can cause substantial reduction in height growth, but is probably a greater pest on seedlings older than 5 years.

Table 1.--Summary of areas examined in 1978 Plantation damage survey and percent stocking levels.

Forest	Ranger Districts	No. of plantations surveyed	Plantation acreages	No. of 1/100-acre plots	No. of seedlings observed	Expected 1/ No. of seedlings	% stocking $\left(\frac{\text{obs.}}{\text{exp.}} \times 100\right)$
Clearwater	Pierce	6	158	40	132	160	82.5
	Palouse	15	609	128	257	512	50.2
	Canyon 2/	2	71	32	6	129	4.7
	Lochsa	5	715	53	55	212	25.9
	Powell	11	221	91	161	364	44.2
	TOTALS	39	1,774	344	611	1,377	MEAN 44.4
Nezperce	Salmon R./ Slate Ck.	5	76	37	40	148	27.0
	Clearwater	3	110	54	131	216	60.6
	Selway	9	268	110	233	440	53.2
	TOTALS	17	454	201	404	804	MEAN 50.2
Lolo	Seeley Lk.	11	492	166	484	664	72.9
	Superior	12	399	151	138	604	22.8
	TOTALS	23	891	317	622	1,268	MEAN 49.1
Flathead	Swan Lk.	15	940	194	307	776	39.6
	Hungry Horse	2	88	31	104	124	83.9
	Glacier View	2	54	21	31	84	36.9
	Tally Lk.	6	167	25	30	100	30.0
	TOTALS	25	1,249	271	472	1,084	MEAN 43.5
	GRAND TOTALS	104	4,368	1,133	2,110	4,533	MEAN 46.5

1/ Based on a desired average of 400 seedlings planted per acre; personal communication, Pete Laird, Regional Silviculturist.

2/ Lost time due to a vehicle accident prevented the field crew from sampling this District more extensively.

Table 2.--Summary of the 1978 plantation seedling survey

CLEARWATER NATIONAL FOREST

NUMBER[1/] OF SEEDLINGS EXAMINED BY SPECIES AND CONDITIONS

P. Pine-65		Lodge. Pine-77		D. Fir-157		W. Larch-60		G. Fir-49		W. W. Pine-92		Eng. Spruce-111	
Undist.	49 (75)	Undist.	52 (68)	Undist.	107 (68)	Undist.	41 (68)	Undist.	26 (53)	Undist.	70 (76)	Undist.	88 (79)
Moist. Stress	9 (14)	Trampled	12 (16)	Moist. Stress	14 (9)	Trampled	2 (3)	Browsed	7 (14)	Trampled	14 (15)	Browsed	5 (5)
												Roots	
Misc.	7 (11)	Misc.	13 (17)	Trampled	4 (3)	Defoliated	11 (18)	Defoliated	8 (16)	Misc.	8 (9)	Compacted	5 (5)
				Browsed	4 (3)	Misc.	6 (10)	Misc.	8 (16)			Misc.	13 (12)
				Defoliated	6 (4)								
				Misc.	22 (14)								

NEZPERCE NATIONAL FOREST

NUMBER OF SEEDLINGS EXAMINED BY SPECIES AND CONDITIONS

P. Pine-130		Lodge. Pine-15		D. Fir-204		W. Larch-0	G. Fir-15		W. W. Pine-0	Eng. Spruce-40	
Undist.	81 (62)	Undist.	12 (80)	Undist.	151 (74)		Undist.	9 (60)		Undist.	23 (58)
Trampled	7 (5)	Trampled	1 (7)	Trampled	8 (4)		Trampled	1 (7)		Trampled	5 (13)
Terminal											
Mined	16 (12)	Browsed	2 (13)	Browsed	28 (14)		Browsed	2 (13)		Browsed	5 (13)
Browsed	10 (8)			Misc.	17 (8)		Misc.	3 (20)		Defoliated	4 (10)
Misc.	16 (12)									Misc.	3 (8)

LOLO NATIONAL FOREST

NUMBER OF SEEDLINGS EXAMINED BY SPECIES AND CONDITIONS

P. Pine-94		Lodge. Pine-32		D. Fir-257		W. Larch-180		G. Fir-10		W. W. Pine-0	Eng. Spruce-49	
Undist.	78 (83)	Undist.	23 (72)	Undist.	167 (65)	Undist.	123 (68)	Undist.	1 (10)		Undist.	28 (57)
Trampled	9 (10)	Trampled	1 (3)	Trampled	9 (4)	Moist. Stress	13 (7)	Defoliated	7 (70)		Trampled	2 (4)
Browsed	2 (2)	Misc.	8 (25)	Browsed	19 (7)	Trampled	2 (1)	Misc.	2 (20)		Defoliated	9 (18)
Misc.	5 (5)			Defoliated	30 (12)	Browsed	2 (1)				Misc.	10 (20)
				Aphids	7 (3)	Defoliated	24 (13)					
				Misc.	25 (10)	Misc.	16 (9)					

FLATHEAD NATIONAL FOREST

NUMBER OF SEEDLINGS EXAMINED BY SPECIES AND CONDITIONS

P. Pine-77		Lodge. Pine-0	D. Fir-189		W. Larch-0	G. Fir-0	W. W. Pine-0	Eng. Spruce-205	
Undist.	50 (65)		Undist.	127 (67)				Undist.	155 (76)
Browsed	13 (17)		Browsed	15 (8)				Browsed	4 (2)
Defoliated	5 (6)		Defoliated	21 (11)				Defoliated	4 (2)
Misc.	9 (12)		Frost Damage	16 (8)				Frost Dam.	24 (12)
			Misc.	10 (5)				Aphids	9 (4)
								Misc.	9 (4)

GRAND TOTAL ALL FORESTS

P. Pine-366		Lodge. Pine-124		D. Fir-807		W. Larch-240		G. Fir-74		W. W. Pine-92		Eng. Spruce-405		All Species
Undist.	258 (71)	Undist.	87 (70)	Undist.	552 (68)	Undist.	164 (68)	Undist.	36 (49)	Undist	70 (76)	Undist.	294 (73)	(69)
Moist. stress	9 (2)			Moist. stress	14 (2)	Moist. stress	13 (5)							(2)
Trampled	16 (4)	Trampled	14 (11)	Trampled	21 (3)	Trampled	4 (2)	Trampled	1 (1)	Trampled	14 (15)	Trampled	7 (2)	(4)
Browsed	25 (7)	Browsed	2 (2)	Browsed	66 (8)	Browsed	2 (1)	Browsed	9 (12)			Browsed	14 (4)	(6)
Terminal mined	16 (4)													(1)
Defol.	5 (1)			Defol.	57 (7)	Defol.	35 (15)	Defol.	15 (20)			Defol.	17 (4)	(6)
				Aphids	7 (1)							Aphids	9 (2)	(1)
				Frost damage	16 (2)							Frost damage	24 (6)	(2)
												Roots Compacted	5 (1)	(0)
Misc.	37 (10)	Misc.	21 (17)	Misc.	74 (9)	Misc.	22 (9)	Misc.	13 (18)	Misc.	8 (9)	Misc.	35 (9)	(10)

1/ Numbers in parentheses are percents.

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